

इंटरनेट

मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 6896 (1973): Connectors (two-way) for railway coach wiring [ETD 14: Electrical Wiring Accessories]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE



IS : 6896 - 1973

Indian Standard
SPECIFICATION FOR
CONNECTORS (TWO-WAY)
FOR RAILWAY COACH WIRING

UDC 621.315.683 : 625.23



© Copyright 1973

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110001

Price Rs 5.50

July 1973

Revised Price

AMENDMENT NO. 1 AUGUST 1989
TO
IS : 6896 - 1973 SPECIFICATION FOR CONNECTORS
(TWO-WAY) FOR RAILWAY COACH WIRING

(Page 8, *clause 8.6.1*) — Substitute the following for the existing clause:

'8.6.1 *Pre-conditioning* — The connector shall be subjected to a moisture treatment for a period of 48 hours by keeping it in a humidity chamber in which the relative humidity is not less than 90 percent at a temperature between 15°C and 35 °C.'

(ETDC 44)

Printed at Printwell Printers. Delhi, India

Indian Standard

SPECIFICATION FOR CONNECTORS (TWO-WAY) FOR RAILWAY COACH WIRING

Electrical Wiring Accessories Sectional Committee, ETDC 44

Chairman

SHRI R. VISWANATHAN

Representing

Central Public Works Department, New Delhi

Members

SHRI S. N. BANWET

Directorate General of Technical Development, New Delhi

SHRI V. G. BAPAT

Buildings & Communications Department, Government of Maharashtra, Bombay

WG CDR H. S. BHATIA

Directorate of Technical Development & Production (Air), Ministry of Defence, New Delhi

SHRI H. C. PANDE (*Alternate*)
DEPUTY DIRECTOR NAVAL DESIGN
(ELECTRICAL)

Naval Headquarters, Ministry of Defence, New Delhi

JUNIOR DESIGN OFFICER (ELECTRICAL)
(*Alternate*)

SHRI B. C. DEY

Conduit Pipe Manufacturers Association, Calcutta

SHRI R. N. DATTA (*Alternate*)

SHRI D. S. DOSHI

Bajaj Electricals Ltd, Bombay

SHRI P. K. SEN (*Alternate*)

SHRI A. N. DUTT

Electrical Contractors' Association of Eastern India, Calcutta

SHRI P. K. BASU (*Alternate*)

SHRI R. K. GUPTA

All India Plastics Manufacturers' Association, Bombay

SHRI A. H. SRIKANTA AIYAR (*Alternate*)

SHRI M. L. KHANNA

Ram Kay Engineering Co Pvt Ltd, Kapurthala
Khosla Plasties Pvt Ltd, Poona

SHRI S. K. KHOSLA

SHRI M. M. KAUL (*Alternate*)

Development Commissioner, Small Scale Industries, New Delhi

SHRI B. MAJUMDAR

SHRI J. V. BAPURAJ (*Alternate*)

SHRI S. V. MARFATIA

Tariff Advisory Committee, Bombay

SHRI B. K. MUKHERJEE

National Test House, Calcutta

SHRI K. K. SHARMA (*Alternate*)

(*Continued on page 2*)

© Copyright 1973

INDIAN STANDARDS INSTITUTION

This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

IS : 6896 - 1973

(Continued from page 1)

Members

SHRI A. S. NAGARKATI

SHRI P. L. KAPUR (*Alternate*)

SHRI E. N. NARAYANASWAMY

SHRI N. RAMAMURTHY

SHRI K. SHAMANNA (*Alternate*)

SHRI B. M. SAMANT

SHRI K. F. MASTER (*Alternate*)

SHRI S. K. SARKAR

SHRI R. S. JAIN (*Alternate*)

SHRI J. M. TOTALA

SHRI R. I. NORONHA (*Alternate*)

SHRI N. SRINIVASAN,

Deputy Director (Elec tech)

Representing

Directorate General of Supplies & Disposals, New Delhi

Director of Industries & Commerce, Madras
Railway Board, Ministry of Railways

The Bombay Electric Supply & Transport Undertaking, Bombay

Engineer-in-Chief's Branch, Army Headquarters, New Delhi

Garware Plastics Pvt Ltd, Bombay

Director General, ISI (*Ex-officio Member*)

Secretary

SHRI S. K. GAMBHIR

Assistant Director (Elec tech), ISI

Indian Standard

SPECIFICATION FOR CONNECTORS (TWO-WAY) FOR RAILWAY COACH WIRING

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 21 February 1973, after the draft finalized by the Electrical Wiring Accessories Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard covers the requirements for connectors (two-way) of surface-mounted type with terminal support and barrier integral with the base for use for railway coach wiring. Connectors covered by this standard may be found suitable for other similar uses also.

0.3 This type of connectors are being used in conjunction with fixed type of fans, berth lights, embarkation lights of railway coaches. This could ensure when the fittings are removed, there are no loose wires hanging which raise the probability of short circuit occurring.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS: 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements of connectors (two-way) of surface-mounted type with terminal support and barrier integral with the base for use for railway coach wiring. These connectors are intended for use in ac and dc circuits with nominal working voltage up to 110 V and a maximum current of 5 A.

1.2 The connectors will be used in the following circuits:

a) 24 V dc circuits in conventional coaches,

*Rules for rounding off numerical values (*revised*).

IS : 6896 - 1973

- b) 110 V dc circuits for dc electric multiple unit coaches and dc airconditioned coaches, and
- c) 110 V ac circuits in ac electric multiple unit coaches and coaches fed by end-on-generation system.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Type Tests — Tests carried out to prove conformity with the requirements of this specification. These are intended to prove the general qualities and design of a given type of connector.

2.2 Acceptance Tests — Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

2.3 Routine Tests — Tests carried out on each item to check requirements likely to vary during production.

3. RATINGS

3.1 The voltage rating shall be 110 V ac/dc.

3.2 The current rating shall be 5 A.

4. MATERIALS

4.1 The connector parts shall be manufactured with the following materials shown against each:

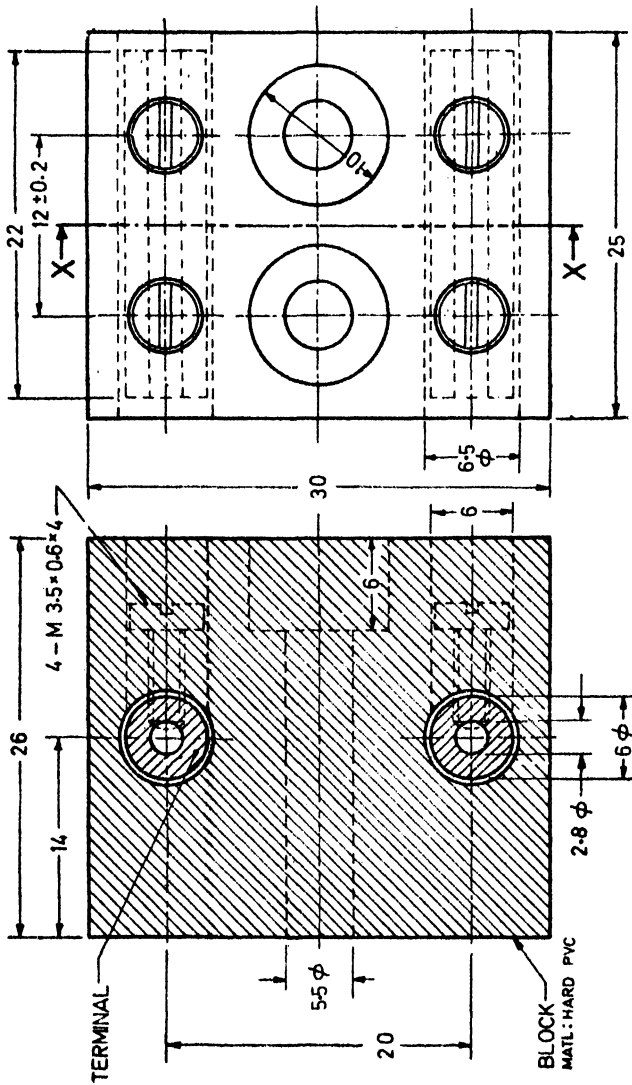
<i>Part</i>	<i>Material</i>
Insulating material	Tough non-ignitable moulding material. Connectors shall be moulded from phenolic moulding powder conforming to IS : 1300 - 1966* Grade 3 or rigid PVC
Current carrying parts	Brass

4.2 The moulded insulating materials shall be resistant to water absorption, which shall not depend on varnish. It shall not be liable to softening and be resistant to tracking under normal use.

5. CONSTRUCTION

5.1 The constructional details of the connector shall be in accordance with Fig. 1.

*Specification for phenolic moulding materials (*second revision*).



SECTION XX

All dimensions in millimetres.

FIG. 1 CONNECTOR (TWO-WAY)

5.2 Terminals and Screws

5.2.1 The terminals and screws shall be as shown in Fig. 1.

5.2.2 The screw shall be long enough under the head to extend to the far side of the conductor hole. In order to minimize damage to the conductor, the screw shall have a slightly rounded end and the wall of the hole, against which the screw clamps the conductor, shall be unbroken. The screws shall conform to IS: 1366-1968*.

5.2.3 All connections shall be made in such a way that the strands of the conductor are prevented from slipping or spreading at the terminals.

5.2.4 Terminals provided for the connection of flexible cords shall have a terminal screw for the flexible cords and a separate terminal screw for the permanent wiring. In any condition of engagement, one terminal screw shall not impede the use of the other.

6. CLEARANCES AND CREEPAGE DISTANCES

6.1 The clearances and creepage distances between live parts of the opposite polarity and also between live parts and the following parts shall not be less than 3.0 mm:

- a) Metal fixing screws, and
- b) Flat mounting surfaces.

7. MARKING

7.1 The connectors shall have the following information marked indelibly:

- a) Manufacturers' name or trade-mark or both,
- b) Rating,
- c) Country of manufacture, and
- d) Any other marking agreed to between the purchaser and the manufacturer.

7.1.1 The connectors may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

*Specification for slotted cheese head screws (diameter range 1.6 to 20 mm) (first revision).

8. TESTS

8.1 Classification of Tests

8.1.1 Type Tests — The following shall constitute type tests carried out on selected samples of connectors, samples being drawn preferably from regular production lot:

- a) Visual examination (8.2),
- b) Dimensional check (8.3),
- c) Test for insulation resistance (dry) (8.4),
- d) High voltage (flash) test (8.5),
- e) Test for moisture resistance (8.6),
- f) Test for temperature rise (8.7),
- g) Test for screws and connections (8.8),
- h) Test for mechanical strength (8.9),
- j) Test for water absorption (8.10)
- k) Test for resistance to heat (applicable to insulating materials only) (8.11), and
- m) Test for tracking (applicable to moulded insulating materials only) (8.12).

8.1.1.1 The number of samples shall be five, all being subjected to the tests specified in 8.1.1 in the given order.

8.1.1.2 Criterion for acceptance — All samples subjected to the type tests shall pass all the tests for proving conformity with the requirements of the standard. If one or more failures occur, the testing authority at its discretion, may call for twice the original number of samples and subject them to all the tests or to those in which failure occurred. No single failure shall be permitted in the repeated test(s).

8.1.2 Acceptance Tests — When lots of large sizes are involved, a suitable sampling plan and the tests to be carried out shall be agreed upon between the purchaser and the manufacturer. In the absence of such an agreement the tests (a), (b), (c), (e), (f) and (h) specified in 8.1.1 shall be carried out on samples selected in accordance with the sampling procedure given in Appendix A wherein the criteria for conformity has also been prescribed.

8.1.3 Routine Tests — The following tests shall be carried out in the sequence shown:

- a) Visual examination (8.2),
- b) High voltage (flash) test (8.5), and
- c) Insulation resistance (dry) (8.4).

8.2 Visual Examination — Each connector manufactured or supplied shall be visually examined for compliance with the relevant requirements specified under 5 and 7.

8.3 Dimensional Check — Connector shall be tested for correctness of specified dimensions, such as overall diameters, dimensions of screws and creepage and clearance distances.

8.4 Insulation Resistance (Dry)

8.4.0 This test may be carried out at prevailing atmospheric conditions with relative humidity not exceeding 80 percent.

8.4.1 The connector shall be mounted on a metal plate by means of screws corresponding in respect of size and type with those which shall normally be used for fixing the connector.

8.4.2 The insulation resistance (dry), shall be measured at a voltage of 500 volts dc after one minute of electrification and without any preconditioning, between the following parts:

- a) The two terminals of the connector, and
- b) The terminals of the connector and the metal support.

The insulation resistance in either case shall be not less than 100 megohms.

8.4.3 For measuring the insulation resistance specified under **8.4.2** (b) all the terminals of the connector shall be electrically connected together and the insulation resistance measured between the plate support and the terminals.

8.5 High Voltage (Flash) Test

8.5.1 An ac voltage of 500 V shall be applied for a period of 5 seconds to the connectors between the terminals specified in **8.4.2**. No breakdown, puncture or arcing-over shall occur during the test.

8.5.2 The test voltage shall be approximately of sine-wave form having any convenient frequency between 40 and 60 Hz.

8.6 Moisture Resistance

8.6.1 Preconditioning — The connector shall be subjected to a moisture treatment for a period of 24 hours by keeping it in a humidity chamber in which the relative humidity is not less than 95 percent at a temperature of $27 \pm 2^{\circ}\text{C}$.

8.6.2 The insulation resistance shall then be measured within 2 to 3 minutes after removal of the connector from the conditioning chamber in accordance with **8.4**.

8.6.3 The insulation resistance so measured shall be not less than 2.0 megohms.

8.7 Test for Temperature-Rise — The temperature-rise shall be measured by means of a copper-constantan thermocouple after the connector has continuously carried the full rated current and attained a constant temperature.

8.7.1 The temperature-rise shall not exceed 20°C on any part.

8.8 Screws and Connections

8.8.1 Screws operated in the normal use shall be tightened and loosened as follows by means of a suitable test screwdriver applying a torque of 0.8 Nm.

- a) Five times for screws operating in an internal thread in metal; and
- b) Ten times for screws operating in an internal thread in insulating material and for self-tapping screws in sheet metal. Screws operating in an internal thread in insulating material shall, each time, be completely removed and reinserted.

8.8.2 In the case of tests on terminal screws, conductor of suitable cross-sectional area shall be placed in the terminal during the testing of the terminal screws. The conductor shall be slightly shifted after each loosening operating.

8.8.2.1 During this test, no damage impairing the further use of screwed connection shall occur.

8.8.3 The shape of the blade of the test screwdriver shall suit the slot of the screw to be tested. The screw shall not be tightened in jerks.

8.9 Mechanical Strength

8.9.1 The connector shall be placed as in normal use and subjected to blows from a suitable impact test apparatus (*see* Appendix B).

8.9.2 Three blows shall be applied. During the test, cracks may appear and small pieces may become detached but the connector shall be deemed to have passed the test, if the terminals are not exposed.

8.10 Water Absorption

8.10.1 Clean, dry connectors from which metallic portions have been removed, shall be broken into pieces having a size within the range of 12 mm to 6 mm. A number of these pieces, between 40 and 50 g in weight, shall be taken for testing. The test pieces shall be heated to $50 \pm 3^\circ\text{C}$ in a dry atmosphere for at least 24 hours and cooled in a desiccator to remove the residual moisture, if any.

8.10.2 The conditioned test pieces shall then be weighed and immersed in distilled water for 24 hours after which the test pieces shall be taken from water and the residual drops of water are removed by rolling them over a piece of filter paper or dry cloth.

The test pieces shall be reweighed to the nearest milligram within 10 minutes after removal from the water.

8.10.3 The percentage of water absorption shall be calculated from these measurements. The material shall not have absorbed more than 1.0 percent of water.

8.11 Resistance to Heat

8.11.1 The sample is tested in a heating cabinet at a temperature of $100 \pm 5^\circ\text{C}$. The duration of the test is one hour. The sample shall not undergo any change impairing its further use.

8.11.1.1 Displacement of the sealing compound is neglected.

8.11.2 External parts of the connector are subjected to a ball pressure test by means of an apparatus shown in Fig. 2. The surface of the part under test is placed in the horizontal position and a steel ball of 5 mm diameter is pressed against this surface by a force of 20 N.

8.11.2.1 The ball pressure test is made in a heating cabinet at a temperature of $125 \pm 5^\circ\text{C}$.

8.11.2.2 After one hour the ball is removed and the diameter of the impression measured. This diameter shall not exceed 2 mm.

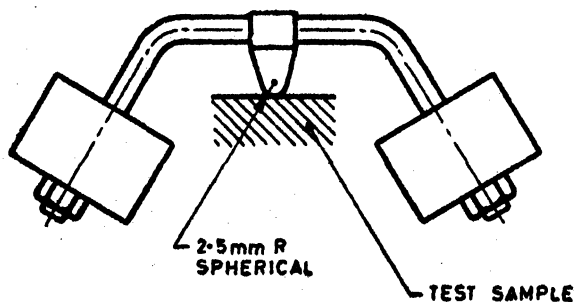


FIG. 2 APPARATUS FOR BALL PRESSURE TEST

8.12 Test for Tracking (Applicable to Moulded Insulating Materials Only)—This test shall be carried out in accordance with IS: 2824-1964* and the tracking index shall be not less than 175.

*Methods for determination of the comparative tracking index of solid insulating materials.

APPENDIX A

(Clause 8.1.2)

SAMPLING PROCEDURE

A-1. LOT

A-1.1 In any consignment, all connectors of the same type manufactured by the same factory during the same period shall be grouped together to constitute a lot.

A-1.2 From each lot a certain number of connectors as specified in Table 1 shall be selected at random and subjected to tests specified in **8.1.2**.

A-2. CRITERION FOR CONFORMITY

A-2.1 In Table 1, N_1 is the size of the first sample. If the number of failures found in this sample is less than or equal to C_1 , the lot shall be considered to be conforming to this standard, and shall be accepted. If the number of failures is greater than or equal to C_2 , the lot shall be rejected. If the number of failures is between C_1 and C_2 , further sample of N_2 pieces shall be taken and subjected to all tests.

A-2.1.1 If the number of failures in the two samples combined is less than C_2 , the lot shall be accepted; otherwise the lot shall be rejected.

TABLE 1 SAMPLING PLAN

LOT SIZE	N_1	N_2	$(N_1 + N_2)$	C_1	C_2
(1)	(2)	(3)	(4)	(5)	(6)
51 to 100	10	20	30	0	3
101 " 200	13	20	39	0	5
201 " 300	20	40	60	1	5
301 " 500	25	50	75	1	6
501 " 800	35	70	105	2	7
801 " 1300	50	100	150	3	10
1301 and above	75	150	225	5	12

NOTE — The plan recommended in this table assures that lots with defectives 4 per-cent or less would be accepted most of the time, and lots with defectives 25 percent and above would be rejected most of the time. The exact consumer's risk depends on the lot size and it would be minimum when the lot size is maximum.

APPENDIX B

(Clause 8.9.1)

IMPACT TEST APPARATUS

B-1. DESCRIPTION OF THE APPARATUS

B-1.1 A typical impact apparatus is shown in Fig. 3.

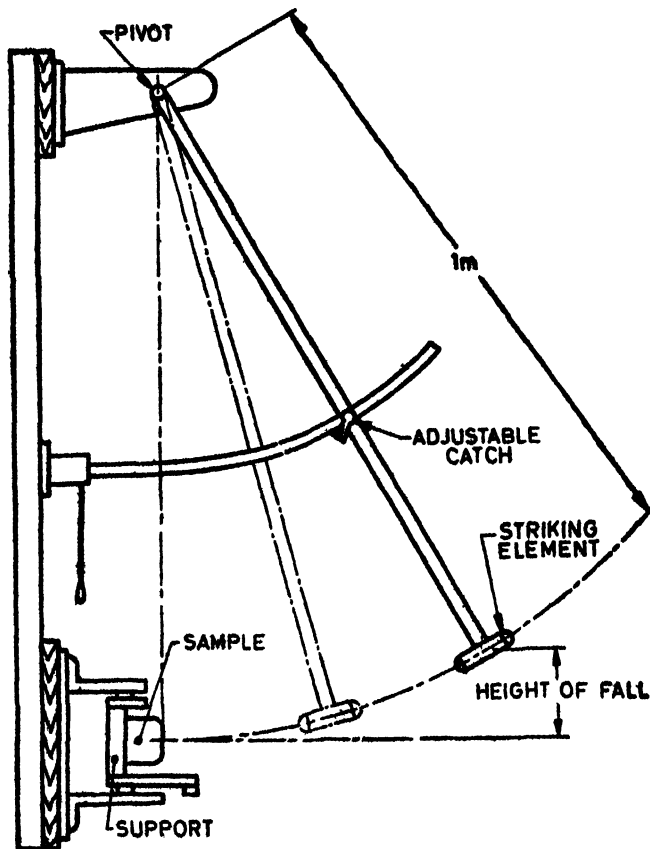


FIG. 3 TYPICAL IMPACT TEST APPARATUS

B-1.2 The pendulum consists of steel tube with an external diameter of 9.0 mm and a thickness of 0.5 mm. It is suspended in such a way that it swings only in a vertical plane. A striking element weighing 0.15 kg is rigidly fixed to the lower end of the pendulum with its axis one metre below the axis of suspension. The striking element has a hemispherical face made of hard polyamide or the like, of hardness of 80 to 100 on Rockwell R scale.

B-1.3 The support for the sample shall be such that the sample can be so placed that the point of impact lies in a vertical plane through the suspension axis of the pendulum.

B-1.4 The sample shall be mounted on the support as in normal use. Cable entries shall be left open. Fixing screws and covers are tightened to 0.26 Nm.

B-1.5 The impact energy of each blow shall be 0.25 Nm.

INDIAN STANDARDS

ON

ELECTRICAL WIRING ACCESSORIES

IS:

- 371-1966 Ceiling roses (*first revision*)
- 1293-1967 Three-pin plugs and sockets outlets (*first revision*)
- 1653-1972 Rigid steel conduits for electrical wiring (*second revision*)
- 2412-1963 Link clips for electrical wiring
- 2509-1963 Rigid non-metallic conduits for electrical installations
- 2667-1964 Fittings for rigid steel conduits for electrical wiring
- 3419-1965 Fittings for rigid non-metallic conduits
- 3480-1966 Flexible steel conduits for electrical wiring
- 3837-1966 Accessories for rigid steel conduits for electrical wiring
- 3854-1966 Switches for domestic and similar purposes
- 4160-1967 Interlocking switch socket-outlet
- 4615-1968 Switch socket-outlets (non-interlocking type)
- 4649-1968 Adaptors for flexible steel conduits
- 4949-1968 2-amp switches for domestic and similar purposes
- 5133 (Part I)-1969 Boxes for enclosure of electrical accessories: Part I Steel and cast iron boxes
- 5133 (Part II)-1969 Boxes for the enclosure of electrical accessories: Part II Boxes made of insulating material
- 6538-1971 Three pin plugs made of resilient material

PUBLICATIONS OF INDIAN STANDARDS INSTITUTION

INDIAN STANDARDS

Over 7 000 Indian Standards covering various subjects have been issued so far. Of these, the standards belonging to the Electrotechnical Group fall under the following categories:

Acoustics and acoustical measurement	Instrument transformers
Automobile electrical equipment	Insulating materials
Batteries	Insulators and accessories
Cinematographic equipment	Integrating meters
Conductors and cables	Lamps and lamp accessories
Domestic electrical appliances	Lifts and escalators
Electric welding equipment	Lightning arresters
Electrical installations, codes of practice	Motors and generators
Electrical instruments	Nomenclature and symbols
Electron tubes and valves	Power capacitors
Electronic components	Power converters
Electronic equipment	Relays
Environmental testing procedures	Rotating machinery
Fans	Semiconductor devices
Flameproof electrical equipment	Switchgear and controlgear
High voltage techniques	Transformers and reactors
Illuminating engineering	Winding wires
	Wiring accessories
	Unclassified

OTHER PUBLICATIONS

ISI Bulletin (Published Every Month)

Single Copy	...	...	...	...	...	Rs 3.00
Annual Subscription	...	...	...	...	...	Rs 25.00
Standards : Monthly Additions						
Single Copy	...	...	...	...	...	Re 0.30
Annual Subscription	...	...	...	...	...	Rs 3.00
Annual Reports (from 1943-49 Onwards)	...	...	...	...	...	Rs 2.00 to 5.00
ISI Handbook, 1972	...	...	...	...	...	Rs 20.00

INDIAN STANDARDS INSTITUTION

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110001

Telephone : 27 01 31 (20 lines)

Telegrams : Manaksanstha

Branch Offices:

'Sadhna', Nurmohamed Shaikh Marg, Khanpur, AHMEDABAD 380001	Telephone 2 03 91
F Block, Unity Bldg, Narasimharaja Square, BANGALORE 560002	2 76 49
534 Sardar Vallabhbhai Patel Road, BOMBAY 400007	35 69 44
5 Chowringhee Approach, CALCUTTA 700013	23-08 02
5-9-201/2-A (First Floor), Chirag Ali Lane, HYDERABAD 500001	3 44 35
117/418 B Sarvodaya Nagar, KANPUR 208005	82 72
64 General Patters Road, MADRAS 600002	8 72 78